The Total Physical Response Method for Second Language Learning

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Abstract

More than twenty-one experiments were completed to explore a novel learning strategy called the Total Physical Response Method. This method was designed to accelerate listening comprehension of a foreign language by having subjects give a physical response when they heard a foreign utterance. For example, if S heard in Russian the command, "Stand, run to the table and pick up the green book," the S immediately responded by standing, running to the table and picking up the green book.

The results were as follows:

1. The listening comprehension of a second language was significantly better (usually at $p < .001$ using two-tailed t tests) if Ss physically acted in response to foreign commands than if they translated, orally or in writing, the commands into English.
2. Whatever happened in the motor act to accelerate learning operated during the retention tests and not during training.
3. No single component of the motor act could account for the acceleration in learning. The intact pattern of the motor act seemed to be necessary for the increase in learning.
4. The motor act became a powerful facilitation to learning only as the complexity of the learning task increased.

Across all experiments most of the mean differences were not significant when the data were based on simple, one-word Russian commands such as "Stand!", "Walk!", or "Sit!" Only as the complexity of the foreign utterance was increased did the motor act become a variable producing a dramatic change in learning.

5. The facilitating effect of the motor act held for complex foreign utterances no matter what the time interval between training and the retention test. This interval was varied from immediacy to 24 hours, 48 hours and two weeks.
6. In almost all contemporary language learning methods, the student attempts to learn listening and speaking simultaneously. Even in the audio-lingual method, the student is required to speak foreign utterances on the first day of training. Our data showed that when the listening and speaking of Russian were learned together, listening fluency was impeded. This suggested that perhaps listening training should be continued for a long time without an attempt to speak before the student is asked to make any utterance in the foreign language.
7. Finally, our data indicated that adults were far superior to children in listening comprehension of Russian when all Ss learned with the Total Physical Response Method. This seems to contradict the common belief in the superiority of

children for learning a foreign language. However, future studies may show that children have a pre-puberty biological proclivity which enables them to produce foreign utterances with fidelity.

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The Total Physical Response Method for Second Language Learning[1]

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After studying a foreign language in school for two years, how fluent is the average American? The answer is that the student not only has almost zero fluency, but negative learning may have resulted if the individual now has a fearful attitude towards foreign language learning.

The indictment against contemporary methods of language learning is even more serious. For example, I have tried this demonstration with many groups of adults from PTA parents to college seniors: first I would ask how many people in the audience had studied Spanish for two years in high school. Then from the raised hands, I selected someone at random and asked that person to say something to me in Spanish. Usually, after some hesitation, the individual will say, "¿Como esta Usted?"

I would then immediately respond in Arabic with, "I'm fine, thank you. How are you?" Most commonly this was followed by a period of silence and usually a puzzled expression appeared on the individual's face. There is a high probability that the person who had studied Spanish for two years will not recognize that the language I spoke in response to his Spanish utterance was not Spanish.

After two years of studying Spanish, a proportion of students - and these are not in the minority - not only have zero fluency for listening, speaking, reading, or writing Spanish, but they cannot always distinguish Spanish utterances from non-Spanish utterances.

The fact that Americans seem to be underachievers in foreign language learning has national significance as a critical research problem. This is documented with a shocking fact published in a doctoral dissertation by Professor Miel at the Air University (1958). Miel stated that of all our official American representatives abroad, only one in thirty could speak the language of the host country let alone read a local newspaper for cues that would enable predictions of changes in feeling and behavior.

Royce Brier, who is a syndicated columnist, commented in the San Francisco Chronicle (1961) that "...if all the Yankees who have business in Latin American, political or commercial, could speak fluent Spanish, a good half of the anti-Americanism so long a way of life down there would vanish." A dramatic illustration that indeed this may be true is the reaction of the shirtsleeved peasants of La Morita, Venezuela to Jacqueline Kennedy in December of 1961.

President Kennedy had to halt for a translation after every few words of his speech to the farmers at the agriarian reform center in La Morita. Then he introduced Mrs. Kennedy by announcing, "Jacqueline does not need an interpreter." Mrs. Kennedy, who had been sitting next to Venezuelan President Romulo Betancourt, approached the microphone and spoke unhesitatingly in perfect Spanish. She said: "I have been very happy to have been able to accompany my husband here. I have been greatly impressed by efforts made here to improve the life of the people.

"No father or mother could be happy until they have the possi-

bility of jobs and education for their children. This must be for all and not just a fortunate few."

Royce Brier (1961) commented that "...the Latin Americans, because Mrs. Kennedy's words were taped and rebroadcast, are bound to feel that here at last was a Yankee, wife of the Yankee President, who understands them, and this is likely to be remembered when a great deal of diplomacy, and even material benefit, is forgotten."

Americans who are able to communicate with foreigners in their own language may have a powerful impact as illustrated with this true story. There is a common belief in the Middle East that no non-Arab can learn to speak Arabic. An American woman who speaks fluent Arabic, was on an Egyptian airliner which was flying from Athens, Greece to Cairo, Egypt. When the stewardess, who was an Egyptian girl, came down the isle, the American woman said in Arabic, "May I have a glass of cold water?" The dialogue that follows was spoken entirely in Arabic:

Stewardess: "Of course, I would be delighted. (pause) Incidentally, how long have you been away from Cairo?"

American: "I have never been to Cairo."

Stewardess: (She appeared puzzled as she curiously looked at details of the American woman's clothing.) "You're

an American!"

American: "Yes."

Stewardess: "When the plane lands, come with me."

When the plane had taxied to a stop, the stewardess escorted the American woman to a small building situated next to the landing field. Inside were custom's officials in green military-type uniforms. The men were sitting, drinking Turkish coffee, and chatting in Arabic.

The stewardess announced to the men, "This woman is an American and she speaks Arabic." Then turning to the American she urged, "Speak to them in Arabic!"

The American woman, somewhat startled, carried on a light, pleasant conversation about the weather and the plane trip from Athens. As she spoke, broad smiles appeared on the faces of the custom's officials. They were so delighted to discover an American who could speak Arabic that all her luggage was admitted into the country without an inspection. The American woman, simply by speaking Arabic, became something of a minor celebrity in Cairo.

Attempted Solutions

This may be something of an oversimplification, but probably all methods[2] which have been tried to teach a second language can be classified into one of the following approaches: the translation method, the audio-lingual method, or the direct method.

In the translation method, which is familiar to many generations of American students, the strategy is to convert a foreign utterance into English. From English the student then understands the meaning of the foreign utterance. In theory, the student's dependency on

English is eventually supposed to vanish so that one will then be able to "think" in the alien language. The goal is to understand the meaning immediately when one hears or sees the foreign utterance. The problem is that most students never achieve a level of fluency in which they are independent of English as a mediator.

In the audio-lingual approach, most of the instruction is directed towards the primary goal of speaking a foreign language. Reading and writing are secondary goals, which have lower priority. From the very first day of training, the student is pressed, urged, and guided to make utterances in the foreign language. Meaning is communicated to the student either in pictures, English translations, or pantomine. Most of the drill is in listening and speaking. Scherer and Wertheimer (1964) tried to discover how much fluency can be achieved with the audio-lingual method.

The experimental design was to compare the performance of students who studied German with a translation approach versus students who studied German with the audio-lingual method. In the translation method most of the drill in German was reading and writing while in the audio-lingual approach the drill was listening and speaking.

The expectation was that students in the audio-lingual group would show dramatically more fluency in speaking German, but this expectation was not confirmed. Those students in the audio-lingual group did excel in their listening and speaking of German, but only to a moderate extent.

Probably the technique used by the Berlitz school illustrates the direct method. The procedure is that one student is in a room with one instructor who begins to speak the foreign language immediately and he urges the student to imitate. Meaning is conveyed with gestures, pictures, and objects. Continually the student is pressed to speak.

There is a strong resemblence between the direct method and the audio-lingual approach. A blending of these two approaches is applied in the Defense Language Institutes which have the primary

mission of teaching a foreign language to military personnel. Intuitively one has the impression that either the Berlitz School or the Defense Language Institute produces a keener level of fluency than the usual high school or college program. This impression may be something of an illusion when a careful evaluation is made.

For example, the Berlitz School has a one to one relationship between the student and instructor while the Defense Language Institute (DLI) has an eight to one ratio. Contrast that fact with the 25 to one student-teacher ratio in the usual school setting.

Next, consider the factor of motivation. The Berlitz student usually has a specific and pressing need to acquire the new language such as the business executive who must sell a product in a foreign market. At DLI, most students have volunteered for language study and receive a full salary while they learn.

Then there is the factor of aptitude. The students at DLI have been screened with a battery of tests so that only those with a high probability of foreign language success are admitted to the program.

Finally, the element of time is often ignored by those who suggest that the programs at Berlitz or the Defense Language Institute should be imitated by our public schools and colleges. For instance, DLI students in the Arabic, Chinese or Russian programs study these languages eight hours a day, five days a week for twelve months. This is about equivalent to taking a course in Spanish in college every semester for eight years. Is there any doubt that one would have a high fluency in Spanish after eight years of college training?

This should not be interpreted as a criticism of the Berlitz School or the Defense Language Insitute. The point here is that given a generous amount of time, any method, including translation, may be effective.

A Novel Approach

Especially in the usual school situation, the method of foreign language learning may have minimal effectiveness because the program is over-ambitious. For example, given only one hour a day in high school for foreign language training, it is unrealistic to expect fluency in listening, speaking, reading and writing.

Even an objective of listening and speaking is an unrealistic expectation with the limited amount of time available. Therefore we suggest that in the first stage of training, only one of the four language skills be selected and preferably this goal should be listening fluency.

For at least one semester in college or six months to a year in high school, the goal of foreign language learning should be listening fluency only. The listening fluency should be so keen that when the student visits Mexico, he can understand almost anything he hears on the street, on television or on radio. When this level of comprehension is achieved, the student may be ready for a graceful transition to speaking Spanish.

The problem is to invent a strategy to achieve the objective of listening fluency. Such a strategy has been created. It is called the Total Physical Response Method. This approach has some similarity to how children seem to learn their first language. For example, young children in America acquire a high level of listening fluency for English before they make English utterances. This listening fluency can be demonstrated by observing the complexity of commands which the young child can obey before he learns to speak; and even as speaking develops, listening comprehension is always further advanced.

The strategy of the total physical response is to have the students listen to a command in a foreign language and immediately obey with a physical action. For example, two students will sit on either side of the instructor. In Japanese, the instructor may say tate and immediately along with the instructor, the students stand up. Then he may say aruke and everyone walks forward.

Other commands may be tobe (jump), mawore (turn), kagame (squat), and nashire (run). The training begins with brief one-word utterances, but within thirty minutes, the morphological and syntactical complexity of the commands has been increased as illustrated in the following commands:

Isu kara tatte, kokuban no anata no namae o kese.
Stand up and erase your name from the blackboard.

Kara no namae o enpitzu de konokami ni kake.
Take the pencil and write his name on this paper.

Sono hana o tsukue kara tori, kanojo ni watase.
Take that flower from the desk and give it to her.

The procedure of applying the learning strategy of the total physical response may be seen in a motion picture entitled, "Demonstration of a New Strategy in Language Learning." This fifteen minute film is available from the Film Library of the University of California at Berkeley, Berkeley, California. In the motion picture, we show the complexity of Japanese utterances which was understood by three twelve-year-old American boys after only twenty minutes of training. Included in the film is a sample of retention after a time delay of one year.

Plan of this Paper

In 1964, scientific officers from the Personnel and Training Branch of the Office of Naval Research viewed the film just described and examined data from preliminary studies with the total physical response learning approach (Asher, 1964; Asher, 1965; Kunihira and Asher, 1965). From this came approval for a research proposal to explore, in experimental laboratory studies, some of the parameters of the total physical response technique.

After the basic procedure is described, preliminary findings will be reviewed to show that the Total Physical Response Method applied to the problem of learning to understand spoken Russian produced a highly significant increase in retention when compared to a situation in which Ss translated Russian utterances into English. Next, we demonstrated that the facilitating effect was identified with performance - the retention tests - rather the training task. Then experiments were designed to discover why motor acts during the retention tests were so important in learning listening comprehension of Russian. The attempt was to trace the single component within the motor act which could explain the powerful facilitation of learning.

The exploration of the motor act was followed by experiments to determine what effect translation had on the acquisition of listening comprehension for Russian. Then other miscellaneous hypotheses were tested for alternate ways to explain why the Total Physical Response Method worked so effectively.

Next, what is the effect on listening comprehension when the student attempts to learn both listening and speaking of Russian together? This experiment has important implications for the audio-lingual approach in which the listening and speaking training takes place almost simultaneously.

Finally, is it true that children are far superior to adults in foreign language learning? In an experiment, adults were compared with children when everyone learned to understand Russian in a play-type situation.

Basic Procedure

The Act-Act Group. Four Ss were seated with two on each side of E who began the training by reading these instructions:

> You're going to be learning some Russian words this week. The Russian words are to be played on the tape recorder (point to recorder). When you hear the Russian words, do exactly what I do. I'll be showing you what the Russian words mean. For example, if the Russian

word means to walk, I'll walk. Listen carefully, then follow me. Try to act as quickly as you can. Do not say the words outloud. Just be silent, follow me, and try to learn what the words mean. Are there any questions?

Immediately after the instructions were read, E turned on the tape recorder and presented the first unit of training which consisted of the following utterances in Russian, each of which was given approximately ten times: stand, sit, walk, stop, turn, squat, run. The sequence was varied so that Ss did not simply memorize a fixed pattern of behavior. After each Russian utterance, E along with the Ss executed the appropriate action response. For instance, if the Russian command was "run," E and Ss ran. After 1 1/2 minutes of training in which Ss had responded five times to each Russian utterance, E said:

From now on, I will slow down a little and you try to act before I do. When you hear the Russian, go ahead of me if you can.

Then for another 1 1/2 minutes E and Ss again physically acted in response to each command which they heard for five more times. After the completion of Unit I Training, E said:

Now we are going to see how well you can remember what you learned. Each of you will follow the Russian words by yourself. (S's name), you'll be first. The rest of you will wait your turn outside. While you are waiting, please do not talk about what you have heard.

The retention test contained the same utterances used in training but the order of presentation and number of exposures differed from the training session. Each S heard 20 utterances

which lasted about 1 1/2 minutes. E recorded the number of correct physical responses on a score sheet.

After each S had been tested, Ss returned to the room for Unit II training. This session began with a brief review and then the single utterances were expanded as follows:

Walk to the door.
Walk to the window.
Walk to the chair.
Walk to the table.
Run to the door.
Run to the window.
Run to the chair.
Run to the table.

In the nine minutes of training, the set of Russian sentences was presented three times in a varying order. After training each S was individually given a 1 1/2 minute test which included four single words and the short sentences. Single words were included because these were an integral part of the action as "stand!", "stop!," "turn!," and "sit!."

Twenty-four hours later, Ss returned and individually received a two minute retention test consisting of 18 single Russian words and the eight short Russian sentences. The order of presentation was different from previous training and tests.

Immediately after the recall test, there was six minutes of Unit III training which began with a brief review of utterances from prior training and then the following new sentences:

Pick up the pencil.
Put down the pencil.
Pick up the book.
Put down the book.
Pick up the paper.
Put down the paper.

Pick up the paper and pencil.
Put down the pencil, book, and paper.

In the retention test, S physically responded to Russian utterances which they had heard in training, but they also heard novel Russian commands. Novelty was defined as the recombination of elements into sentences never experienced in training, as for example:

Run to the table and pick up the paper.
Pick up the pencil and walk to the window.
Run to the chair and put down the book.

The two minute retention test after Unit III included one single, eight short, and nine long utterances. A long utterance was defined as a Russian sentence which had more than one verb. One of the short and five of the long utterances were also scored as novel.

Forty-eight hours later Ss returned for another individual retention test, 2 1/2 minutes in length, which contained two single, six short, and ten long utterances. One of the short and four of the long utterances were also scored as novel. Then came Unit IV training which began with a review of previous learning and then Ss acted in response to the recombination and expansion of learned patterns such as:

Pick up the paper and pencil and put them on the chair.
Run to the table, put down the paper, and sit on the chair.
Walk to the door, pick up the pencil, put it on the table, and sit on the chair.

The training in Unit IV required 7 1/2 minutes in which each utterance of varying complexity was heard only once. The retention test which followed was 3 1/2 minutes per S and was made up of eight

single, three short, and nine long utterances. Two short and five long sentences were counted as novel utterances.

Two weeks later Ss returned for a final retention test of six minutes in which there were thirteen single, thirteen short, and fourteen long utterances. Two short and five long utterances were scored as novel.

The total amount of time in small group training was 25 1/2 minutes as compared with almost an equal amount of time in individual retention tests of nineteen minutes.

Scoring of Retention Tests. The scoring of the retention tests was in behavioral units. For example, if a S in the experimental group heard in Russian the command, "Run to the table and pick up the flower," he received one point for running, another point if he ran to the table, another point if he picked something up, and a point if the item picked up was a flower. Therefore that utterances in Russian had a total possible score of four points.

Four categories of complexity were set up: single words, short, long, or novel utterances. A short utterance was a sentence with one verb and one object, such as "Walk to the chair." A long utterance was defined as a sentence with more than one object of the verb (i.e., Pick up the book and pencil.") or more than one verb (ie., "Walk to the chair and pick up the pencil.") A novel utterance was defined as some recombination of sentences which Ss had heard in training so that, in this sense, the command was presented for the first time in the retention tests.

Subjects. All subjects, except for the children in Study 13, were undergraduate college students most of whom were between the ages of 18 and 21. They were recruited from classes at San Jose State College and participated in response to an incentive of either extra-credit in a class in which they were enrolled or a token payment of $5.00.

Preliminary Findings

In previous research with Russian (Asher, 1965) and Japanese (Kunihira and Asher, 1965) the experimental group acted in training by listening to a foreign utterance and obeying the command along with the model. During the retention tests, each subject individually listened to the foreign utterances played on a tape recorder and physically obeyed the commands if he understood the meaning.

The experimental group was called the Act-Act Group because they physically acted during both the training and the retention tests. The control group was called the Observe-Write Group because they sat and observed the model act during the training and then wrote English translations during the retention tests.

Results

The findings were similar for Russian and Japanese. The data showed a highly significant difference in retention ($p < .005$) favoring the Act-Act Group. The Act-Act Group had significantly better listening fluency than the Observe-Write Group no matter whether the complexity of the foreign utterance was short, long, or novel sentences. This superiority in retention held when the retention tests were given immediately after training, 24 hours later, 28 hours later or two weeks later. Another interesting finding was that members of the Act-Act Group all tended to cluster near the maximum possible scores on each retention measure.

Study I: Learning versus Performance

In preliminary studies with the total physical response, we found that the Act-Act Group was superior in the retention of either Russian or Japanese in comparison with an Observe-Write Group. The conclusion that the differences were the result of training may be pre-mature since both the experimental and control groups did not respond alike in the retention tests. One group acted and the other wrote English translations during the retention tests.

It is possible that the dramatic facilitation of listening fluency was a function not of what happened in training but of the format for the retention tests. It is conceivable that the learning of the group who overtly acted and those who covertly acted in training was identical, but performance was either facilitated or impeded by what the Ss had to do in the retention tests.

The design of Study I contrasted two groups of college students when one group (N=18) overtly acted in training while the other (N=19) observed a model act in training During the retention tests, each S in either group overtly acted. The first group was the Act-Act Group and the second was called the Observe-Act Group.

The instructions read to the Observe-Act Group before training were as follows:

> You're going to be learning some Russin words this week. The Russian words are to be played on the tape recorder (point to recorder). When you hear the Russian words, watch what I do. I'll be showing you what the Russian words mean. For example, if the Russian word means to walk, I'll walk. Listen carefully, then try to imagine that you are doing what I'm doing. Do not say the words out loud. Just be silent, watch me, and try to learn what the words mean. Are there any questions?

Results

If overt action is important in the retention tests rather than in training, we expected no significant differences between the Act-Act Group and the Observe-Act Group. Indeed, this is what was found because when two-tailed *t* tests were applied, there were no significant differences in performance at the .05 level on all thirty retention sub-tests, except one.

Study 2: Learning versus Performance

Study 2 was designed to further verify that the dramatic facilitation of listening fluency was a function not of what happened in training but of something operating within the retention tests. This notion was tested by comparing one group of college students who overtly acted during training with another group who observed the model act. In the retention tests, the Ss in both groups listened to each Russian utterance and wrote an English translation. The first group was called the Act-Write Group (N=17) and the second was the Observe-Write Group (N=17).

Results

Again, if overt action is important in the retention tests rather than in training, we expected no significant difference between the Act-Write Group and the Observe-Write Group. Just as in Study 1, the expectation was confirmed because when two-tailed *t* tests were applied, there were no significant differences in performance at the .05 level on all thirty retention subtests, except two.

Study 3: Learning versus Performance

As further verification that physical action during the retention tests was more important than physical action in training, Study 3 was completed. The Act-Act Group was combined with the

Observe-Act Group and the Act-Write Group was combined with the Observe-Write Group. This meant that a group (N-37) who either acted or observed in training but acted in retention was contrasted with a group (N=34) who also either acted or observed in training but wrote English in the retention tests.

Results

We expected highly significant differences in retention between the Ss who individually acted during the retention tests as compared with Ss who wrote English translations. The expectation was confirmed.

As may be seen in Table I, when the Russian was rather uncomplicated as in Units I and II all but one t test were not significant at the .05 level, suggesting a homogeneity in ability between the two groups. When the Russian became more complex, as in Units III and IV, most of the two-tailed t tests were significant beyond the .001 level. After two weeks, the group who physicaliy acted in the retention tests was still superior, usually beyond the .001 level.[3]

Insert Table I about Here

Discussion: The Performance Measure

Clearly the data showed that the powerful variables which facilitated listening fluency for Russian were associated with performance rather than learning. Something within the performance measure, that is, something within the retention tests seemed to facilitate listening comprehension.

At a gross level of analysis, the retention test which required subjects individually to act when they heard a Russian command was superior to a retention test in which subjects wrote English translations after listening to a Russian utterance. Total physical responses during the retention test rather than

in training were extremely important. The next step was to analyze the component parts of the action response during the retention tests in an attempt to isolate fine-grain variables which could explain the phenomenon.

The analysis suggested that the total physical response could be segmented into the following components: position, concurrence, cue, and sequence. After each component was defined, experiments were designed to determine which variable might account for the effectiveness of an action response during the retention tests.

Position means that the location of S in the room at the end of a Russian command may, in many instances, give S information as to the probable direction of the next command. For example, in Figure 1, the Russian command was to "pick up the pencil and the book." The S may expect with a high

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Insert Figure 1 About Here

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probability, that the next command will have something to do with the pencil or the book or both. In the control group, when Ss write English translations they may not be as aware of position as those Ss who are physically relocated after each Russian command.

Concurrency means that some Ss may have begun to move before they heard the entire Russian utterance. For instance, consider the command to "Run to the door, pick up the flower, and sit on the chair." If S is in motion running to the door immediately after he hears that part of the utterance, then perhaps he can simplify the problem of comprehension. When S act out each constituent of the Russian utterance and simultaneously listens to the next constituent as is illustrated

in Figure 2, less attention is necessary than if he had to wait for the entire Russian utterance to be said before he moved.

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Insert Figure 2 About Here

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Cue means that the location in the room of the objects manipulated by Ss may give information which, in many instances, will permit S to predict the probable direction of the next command. As an illustration, if S has been instructed in Russian to "...put the pencil on the chair..." then the location of the pencil in the room will give some information about future commands. Any future mention of pencil, for example, should direct S's attention to the chair.

The continual relocation of objects in the room may be valuable information, which is unavailable to Ss who write English translations during retention test.

Sequence refers to the patterned characteristic of the Russian utterance within each retention test. Pattern does not mean that the sequence of utterances in the retention test was identical with the sequence in training. Rather, patterned means that given utterance h there was a high probability that utterance J would follow. For example, if the Russian command was sit, the next would probably be stand. If the command was run, the next would be stop

The factor of sequence operated at maximum in the early units of training and retention, but diminished in later units when the Russian commands became complex and novel.

In studies 4 through 8, each of the four components within the action event was systematically explored and the results will be reported next.

Study 4: Position

In Study 4, a Position-Absent Group (N=15) acted in training and in the retention tests. However, beginning with the reten-

tion test given 24 hours following Unit II training, each S returned to a neutral position after they listened to a Russian command and acted out the instructions. The objects remained wherever they had been placed. For example, if the command was "Walk to the window and put down the pencil," S executed the movement, left the pencil near the window and returned to a neutral position which was to be seated in a chair at one side of the room. Always, in each retention test, S returned to a neutral position after obeying each Russian command.

The instructions for Group 5, the Position-Absent condition, were identical with Group 1, Act-Act, except that these instructions were read to Ss before the retention test for Unit II - 24 hours:

> "I will not play the next utterance until you are in the neutral position. Any questions? If you get confused at any point, please tell me. From now on after you made your response you will return to the neutral position you are in now. Where you are sitting now is the neutral position."

Results

If position is eliminated from the action event during the retention tests, will the accelerated performance vanish? The answer seems to be "no" since a comparison of the Position-Absent Group 5 versus the combined Group 1 (Act-Act) and Group 2 (Observe-Act) resulted in a general pattern of no significant differences. For example, only three in thirty two-tailed t tests were significant at the .05 level and only six in thirty one-tailed t tests reached the .05 level.

Study 5: Concurrency

In Study 5, a Concurrency-Absent condition was designed in which Ss (N=21) acted in training and in the retention tests,

but each S was delayed from acting during retention tests until the entire Russian command has been spoken. The following instructions were read to the Concurrency-Absent Ss in Group 6 before the immediate recall test of Unit III:

> "Do not respond to the Russian commands until the complete utterance has been spoken. That is, wait to make your response until after the speaker is finished. To signal that the utterance is over and that you should begin your response, I will turn off the recorder for a moment like this (DEMONSTRATE). Any Questions?"

Results

If concurrency is eliminated from the action event during the retention tests, will the accelerated performance disappear? The answer again seems to be "no" since only three in 30 of the two-tailed t tests were significant beyond the .05 level when Group 6 was compared with the combined groups 1 and 2.

Study 6: Cue

In Study 6, a Cue-Absent situation was created in which Ss (N=10) acted in the training and in the retention tests. The instructions were identical with Group 1 (Act-Act) except that a set of objects (paper, pencil, book, and flower) was placed at each location S would move during the retention tests beginning with Unit III to the end. For example, before any retention test was administered, a set of objects was placed on the table, near the window, next to the door, and near the chair. There were four sets, consisting of a paper, a pencil, a book, and a flower at four different locations in the room.

The rationale for this set-up was to reduce information the S may generate from his placement of objects as he moves from command to command. For instance, suppose that on a previous command, S had picked up the flower from the table, and placed it next to the door. His next command is "Walk to the window!" Now

he is at the window and he hears the Russian command, "Run to the door, pick up the lower, and put it on the chair." If that command is imperfectly understood S may perform any of a number of different actions. He may, for example, pick up the flower from the window and put it on the chair.

In the Group I situation, however, when cue was present, let us say that S heard "Run to the door and pick up the flower." If the only element he understood was "flower" he may have moved to the door and picked up the flower because it happened to be located near the door. This means that S would have received quite a few extra points which would misrepresent S's comprehension.

Results

If cue is eliminated from the action event during the retention tests, will the accelerated performance be significantly diminished? The answer is "probably not" since only four in 30 two-tailed t tests were significant beyond the .05 level when Group 7, the Cue-Absent condition, was compared with the combined groups I and 2. Even one-tailed t tests were uniformly not significant for Units III and IV, where the effects of eliminating cue should be most visible.

Study 7: Sequence

So far neither position, concurrency nor cue seemed likely explanations for the powerful learning effect which is operative if action is used during retention tests. Next, sequence was explored by creating Group 8 (N=18) and Group 9 (N=18).

Group 8 was an Act-Act condition in which sequence was present in all of the training but absent beginning with the retention test for Unit II = 24 hours. Sequence was eliminated by randomizing the order in which each utterance was presented. Instructions to Ss were the same as in Group I, but before the 24 hour retention test for Unit II, E read the following:

"From now on the test utterances will not be presented in a continuous sequence. They will not be in any special order because the order of presentation has been randomized. After you make your response you will return to the neutral position you are in now. That is the neutral position (POINT). That is the chair (POINT).

I will not play the next utterance until you are in the neutral position. Any questions? If you get confused at any point, please tell me."

Group 9 was an Act-Write condition in which sequence was present in all of the training but absent beginning with the retention test for Unit II - 24 hours. Both Group 8 and 9 acted during the training but during the retention tests, only Group 8 acted while Group 9 wrote English translations.

The instructions read to Group 9 before the first retention test were:

"Now we are going to test how well you can remember what you have heard. You will write the English translation of the Russian command. After you hear the utterance write what it means in English. Please do not go back and change or add to your responses after we have moved on to another utterance. Any questions?"

Then before the 24-hour retention test for Unit II, these instructions were read to the Ss in Group 9:

"From now on the test utterances will not be presented in a continuous sequence. They will not be in any special order because of the order of presentation has been randomized. You should still write the English translation of the Russian command you hear just as you did yesterday. Any questions?"

Results

The first finding was no significant differences on any retention test for Group 8 versus 9. None of the thirty two-tailed t tests was significant beyond the .05 level and even when the one-tailed t test was applied, only one mean difference was significant at $p < .05$.

Therefore, groups 8 and 9 were combined and compared with the combined groups 1 and 2 as seen in Table 2. The results showed that when sequence was eliminated there was a highly significant

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Insert Table 2 About Here

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decrease in retention. Almost every two-tailed t test from Unit III on was highly significant showing a dramatic decrease in performance for groups 8 and 9 in comparison with groups 1 and 2.

A note on interpretation should be added here. The design in Study 7 was not a pure exploration of sequence alone. Since the utterances were randomized it was necessary in Group 8 for the S to return to the neutral position after executing each command. If S had not returned after each utterance to the neutral position the task would have been most confusing. For example, suppose a Russian command was "Run to the chair, pick up the book, and walk to the door." Then if the next utterance was, "Run to the door and put down the pencil," S would be presented with an insolvable task.

For maximum clarity then, in Group 8, it was necessary for S to return to a neutral position after each utterance and to have a set of objects (paper, pencil, book, and flower) in his hands and a set located in each location (the table, chair, door, and window.) This means that for Group 8, sequence, position and cue were absent. Similarly, for Group 9, sequence, position and cue were absent.

The generalization at this point was that when sequence, position and cue were eliminated from the retention test situation, there was a highly significant decrease in the performance of Ss.

Study 8: Position and Cue

In Study 7, the results suggested that sequence, position, and cue all working together seemed to be important in producing accelerated performance during retention tests. But still unanswered is, how critical is sequence alone? This may be tested by comparing Group 8 with Group 10 (in both groups position and cue were absent). However, in Group 10 the utterances during the retention tests were sequenced while in Group 8 the utterances were presented randomly. Therefore, if sequence is important by itself, Group 10 should perform significantly better than Group 8.

Results

The findings, however, did not support sequence as powerful by itself because none of the thirty two-tailed t tests for Group 8 versus Group 10 was significant at the .05 level. Even when one-tailed t tests were applied, only three in thirty were significant beyond the .05 level.

Next, if position and cue together are eliminated, will there be a significant decrease in performance? The answer seems to be "yes" because as seen in Table 3, when position and cue together are absent in Group 10, performance significantly decreases in comparison with combined groups 1 and 2.

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Insert Table 3 About Here

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One could also ask, "Will the interaction of position and cue account for the vast superiority of action over writing during retention tests?" The evidence suggests that indeed this may be true when one compares groups who wrote English translations (Groups 3 and 4) with Group 10. None of the thirty two-tailed t tests and only one of the one-tailed t tests was significant at the .05 level. Therefore, when position and cue was eliminated from the action event during the retention test, the group performed very much like Ss who wrote English translations.

Discussion: Three Generalizations

At this point three generalizations emerged. The first was that whatever was facilitating the listening comprehension of Russian, and probably Japanese also, operated in the event of the retention tests rather than the training.

The second generalization was that a total physical response during the retention tests dramatically increased the performance scores of Ss in comparison with Ss who wrote English translations during the recall tests.

And the third generalization was that when each component of the action event in the retention test was isolated, none could account for the accelerated performance of Ss. However, the interaction of two components, position and cue, seemed to be the most likely explanation for the facilitated learning.

Study 9: Translation

Next, a series of conditions were created to explore the effects of translation on listening fluency in Russian. In each situation, translation was used in training, in retention or in both training and retention. For example, the following is a description of the format for different groups of Ss.

Group	Training Format	Retention Test Format
I1 (N=11)	Oral translation	Acted
I2 (N=17)	Observed the model act	Oral translation
I3 (N=11)	Oral translation	Written translation

14 (N=13)	Observed a model act	Oral Translation with a model in action
15 (N=8)	Oral translation	Oral translation
16 (N=11)	Act	Oral translation while S was peddling an exercise bicycle[3]

Results

First, we expected to find that Group 11 (Translation-Act) would be superior to Group 15 (Translation-Translation). Since Group 11 acted during the retention tests and Group 15 translated, the former should be significantly better than the latter. This expectation was not confirmed since the retention of Russian for Group 11 was generally not significantly different from Group 15.

Secondly, among themselves, none of the groups in which translation was used either in training, retention, or both was significantly better in listening fluency for Russian.

Thirdly, none of the groups which used translation was significantly different in the retention of Russian from Group 3 (Observe-Write) or Group 4 (Act-Write).

Fourthly, of all the translation conditions the one that most attenuated learning was Group 13 in which there was oral translation in training and written translation in the retention tests. The retention for Group 13 was significantly less than groups 2, 3, 11, 14, 15, and 16.

The experimental groups who applied the total physical response as in Group 1 (Act-Act) or Group 2 (Observe-Act) were dramatically higher in retention, usually beyond the .001 level, than any group of subjects who tried to translate.

Discussion: Translation and listening fluency

The data seem to indicate clearly that translation in either training, retention, or training and retention will severely decrease listening comprehension for Russian. The dampening effect of translation is so strong that even when action responses are given by subjects in retention, there will be no acceleration in learning if translation was used in the training. This was demonstrated with Group II in which subjects along with the model, orally translated in training but acted in the retention tests. Therefore, this suggests that the facilitating effect of action responses in retention tests will be cancelled if translation is used in training.

Study 10: Frequency of Retention Tests

Another possible explanation for why listening comprehension could be so sharply accelerated was the notion that just administering many retention tests to Ss somehow facilitated learning. In the design with Russian, we administered seven retention tests to each subject. The total amount of time each S participated in retention tests - 19 1/2 minutes - was almost the total amount of time in training which was 25 minutes.

As a test of this hypothesis, Group 17 (N=20) was given training trials rather than retention tests for Units I through III. For example, in the usual retention test, S listened to a Russian command, then if he understood the utterance, he acted. The retention was transformed into training by simply having the model act along with the S after each Russian command was uttered, during the retention tests. Group 17 was identical with Group I (Act-Act) except that training trials were substituted for retention tests through Unit III.

Results

If the frequency of receiving retention tests is an important learning variable, then Group 17 should perform significantly below Group I on the retention test administered 48 hours after Unit III

training, the one after Unit IV, and the retention test given two weeks after the end of training.

The hypothesis was not supported since none of the fourteen subtests for retention was significant at the .05 level using a two-tailed t test, and even when a one-tailed t test was applied, only two in fourteen reached significance at the .05 level.

Study II: Frequency of Training Trials

There was a mistake in procedure and two groups received half the number of exposures to the Russian commands in the training for Units I, II, and III. These groups were as follows:

Group	Training Format	Retention Test Format
18 (N=18)	Observe a model act	Oral translation with a model in action
19 (N=11)	Oral translation	Oral translation

Except for a reduction in the number of times the Ss listened to Russian commands in training Units I, II, and III, Group 18 was identical with Group 14, and Group 19 was identical with Group 15. It would be interesting to know what effect a decrease in training trials early in the learning experience had upon the retention of Russian. Therefore the retention of Group 18 was compared with 14 and Group 19 was compared with 15.

Results

Table 4 shows that a reduction in training trials in the first three units of training produced a highly significant reduction in retention for the condition in which Ss sat and observed a model

perform in training, then in the retention tests each S individually gave an oral translation while a model acted. For example, if S orally translated a Russian command by saying, "Run to the window," a model would immediately run to the window.

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Insert Table 4 About Here

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When oral translation was used in both training and retention, there was a significant reduction in comprehension of Russian as can be seen when Group 19 is compared with Group 15.

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Insert Table 5 About Here

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Study 12: A Perceptual Readiness to Speak

In other papers I have suggested that the usual audio-lingual attempt to teach almost simultaneously the listening and speaking of a foreign language is a mistake. My reasoning was that the stress of trying to pronounce the alien utterance may retard listening fluency, but this stress can be reduced if one has a perceptual readiness to speak a second language. The optimal strategy may be serial learning in which one achieves listening fluency first before one attempts to speak.

A study was designed to test the hypothesis that an attempt to do both listening and speaking together will decrease one's skill in listening comprehension of Russian. Group 20 (N=15) was like Group 1 (Act-Act) and Group 21 (N=9) was like Group 2 (Observe-Act). The only difference was that in training, each S listened to the Russian command, and then along with the model spoke the Russian utterance. For example, if the Russian command from the tape recorder said, "Run!" the Ss and the model repeated the Russian utterance, then executed the command.

Results

First, Groups 20 and 21 were combined since all thirty retention measures except three were not significant at the .05 level using a two-tailed t test. Then when the combined groups 20 and 21 (N=24) were compared with the combined groups 1 and 2 (N=37), the results may be seen in Table 6.

Applying a one-tailed t test the general pattern suggested that the hypothesis was supported. When Ss learned the speaking and listening of Russian together, listening comprehension was rather severly retarded.

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Insert Table 6 About Here

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Study 13: Developmental Factors

There is a common belief that children are better able than adults to learn a foreign language. This belief may be an illusion if children living in a foreign country learn the new language through play activity while their parents try to learn independently of physical behavior.

It may be that children outperform adults in foreign language comprehension because the new language is learned through play activity in which the child makes action responses. For the child, the second language tends to be synchronized with physical responses ("Come on, Sam. Let's ride our bikes!"). The adult, by contrast, tries to manipulate the foreign language quite independently of physical behavior. The adult tends to be physically static when he receives or transmits the new language. ("It's a beautiful day today, isn't it?").

If the child in a foreign country uses an action response but the adult does not, this may partially explain why children become more fluent than adults. An intriguing question then is, how do adults compare with children when both apply action responses in controlled situations?

This study which was published in Child Development by Asher and Price (1968), compared the listening comprehension of Russian for children (ages 8, 10, and 14) with college adults. The children (N=96) were drawn from the second, fourth, and eighth grades of a public school in San Jose, California. The adults (N=37) were college students recruited from undergraduate general psychology courses at San Jose State College. None of the children or adults had prior training or exposure to Russian. The Ss from the 8-year-olds to adults were divided into two groups at each level. The conditions were the Act-Act Group and the Observe-Act Group. The average IQ for the children in each group as measured by the California Test of Mental Maturity was 115 for the 8-year-olds, 113 for the 10-year-olds, and 114 for the 14-year-old children.

Results

The findings for single, short, long or novel utterances were quite similar to the histogram in Figure 3.

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Insert Figure 3 About Here

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Surprisingly, not only did the adults dramatically outperform children on all measures of retention, but there was an inverse relationship between age and listening comprehension. Adults performed on the average near the maximum score in comprehension of Russian, while second graders were the lowest of all groups tested. Intermediate between the adults and the second graders were fourth and eighth graders. This generalization was consistent as may be seen by examining the results for the Act-Act Group as contrasted with the Observe-Act Group.

Discussion

This study suggests that when adults learn a second language under the same conditions as children, the adults are superior. This generalization should be limited, at this time, to listening fluency. Future studies may show that children have an advantage in fidelity of sound production.

The comparison of college adults to children may be blurred somewhat because of a selectivity factor for the adults. The college students at San Jose State College are selected from among the top one-third of high school graduates in California. Therefore, we would expect above-average mental ability for the adults. However, it has been shown by Pimsleur (1966) and others that general mental ability is a light-weight variable in second language learning, accounting for less than 20 per cent of the variance.

The second finding was that among children, the older child, the 10- and 14-year-old, tended to be significantly better than the 8-year-old in his understanding of spoken Russian. Short attention span has been suggested as an explanation for the poor performance of the 8-year-old in understanding the Russian commands. When the Russian utterance was long and involved ("Pick up the pencil, walk to the chair, put down the pencil, and run to the window"), one might expect the 8-year-old child to have difficulty even if the utterance was spoken in English. Short attention span seems plausible for complex Russian commands, but this explanation does not account for the relatively low scores by the 8-year-old for single Russian words as "run," "walk," and "sit."

Study 14: Individual Differences

How similar was the language aptitude of the college subjects in each of the twenty-one groups? Two sources of information about individual differences in language ability suggest that there probably was homogeneity of language aptitude from group to group.

First, the Modern Language Aptitude Test (MLAT) was administered to Ss in twelve groups. The results, as may be seen in Table 7, showed a range of about 35 points from a low mean MLAT of 98 for Group 13 to a high mean of 134 for Group 16.

Insert Table 7 About Here

When two-tailed t tests were applied, only three mean pairs in sixty-six were significant at the .05 level of confidence. Since this is only 4% of all the tests, chance is probably the most reasonable interpretation for the three significant t values.

Secondly, consistently, across all twenty-one groups almost every two-tailed test comparison for the retention tests administered immediately after Units I and II, and 24 hours after Unit II was not significant at the .05 level. This suggests a homogeneity in performance early in training for all groups. Differences in performance emerge only when the utterances become more complex as in Units III and IV.

Conclusions

Preliminary studies indicated that the comprehension of spoken Japanese or Russian could be significantly increased if Ss were in action, applying a technique called the Total Physical Response Method. The control groups translated the foreign utterances into English.

In Studies 1 through 3, experiments were designed to locate what part of the learning experience was producing the dramatic increase in retention. We found that the facilitating effect occurred in the performance task - during the retention tests - rather than in the training period. During training it was unimportant whether Ss listened to Russian commands and then acted along with a model or merely sat and watched a model act. When the time came to demonstrate comprehension in a retention test, it was most important that Ss listen to a Russian command, then obey in a physical action rather than merely sitting and translating the Russian into English either orally or in writing. Action during the retention tests was critical for the S to show high achievement in listening comprehension of Russian ($p < .001$ using two-tailed t tests).

In Studies 4 through 8, the attempt was to identify the component in the performance task which produced the increase in retention. The performance task was analysed into these components: position, concurrency, cue, and sequence. We found that no single component could account for the facilitating effect. The most reasonable explanation seemed to be that all of the components functioning as an integrated pattern generated a significant increase in the comprehension of Russian.

Studies 9 through 11 explored alternate explanations and showed that the most serious impediment to comprehension for foreign utterances was the use of oral or written translation either in the training task, retention tests, or both.

Study 12 was important in showing that attempting to learn listening and speaking of Russian together, as is characteristic of the audio-lingual method, impedes comprehension. Ss who learned listening

comprehension had significantly better performance than Ss who tried to learn the listening and speaking of Russian together.

The findings from Study 13 suggested that perhaps the common belief in the superiority of children in learning foreign languages may be a myth. If children living in a foreign country learn the native language in play activity, this may explain why the children outperform their parents. When adults and children in Study 13 learned listening comprehension of Russian with the total physical response method, which has similarities to play activity, the adults were vastly superior. The children were drawn from the 2nd, 4th, and 8th grades. Another startling finding was an inverse relationship between age and performance. The adults were highest in achievement, then came the 4th and 8th graders, and finally the 2nd graders.

Summary

Problem

Americans are under-achievers in learning foreign languages. After two years of foreign language training in the usual school setting, most students have almost zero fluency in listening, speaking, reading, and writing. Even among our official American representatives abroad, only one in thirty can speak the language of the host country. (Miel, 1958).

Proposed solution

Perhaps our school programs in foreign languages have been too ambitious. It may be unrealistic to expect fluency in listening, speaking, reading and writing with only an hour a day of training.

A more effective strategy may be to concentrate on only one skill, especially in the early stage of foreign language training. The skill we recommend is listening comprehension. If the student achieves a high level of listening fluency, then the transition to speaking may be graceful and non-stressful.

Total Physical Response Method

How can skill in listening comprehension be achieved? One technique which produced rapid, non-stressful learning to understand a second language is the Total Physical Response Method.

In this paper we have demonstrated that when students learned to understand Russian with the total physical response method, their comprehension was accelerated far beyond students who tried to learn with translation methods. The differences in comprehension of spoken Russian were highly significant usually beyond the .001 level of confidence using two-tailed t tests.

Why the method works

Twenty-one experiments were completed in an attempt to discover what factors within the Total Physical Response Method were producing the acceleration in learning.

The first finding was that events in training were not as important as what happened during the retention tests. During training, it did not matter whether students listened to a Russian command and then acted along with a model or merely sat down, listened to the Russian and watched the model perform a physical action. What was important - indeed extremely important - was for each student to perform motor acts during the retention tests. For example, if in a retention test, the student heard the command in Russian, "Walk to the table," the student, if he understood, would immediately walk to the table.

Next, the motor act which occurred during the retention test was analysed into component parts and experiments were designed to explore the facilitating effect of each component. The results showed that no single component could account for the accelerated learning. The intact pattern of the motor act seemed to be necessary for the achievement of a high level of listening fleuncy.

The third finding was that the motor act became a powerful facilitation to learning only as the complexity of the learning task increased. Across all experiments most of the mean differences were not significant when the data were based on simple, one-word Russian commands such as "Stand!", "Walk!", or "Sit!" Only as the complexity of the foreign utterance was increased did the motor act become a variable producing a dramatic change in learning.

The fourth result was that the facilitating effect of the motor act held for complex foreign utterances no matter what the time interval between training and the retention test. This interval was varied from immediacy to 24 hours, 48 hours and two weeks.

Next, we found that the most serious impediment to the comprehension of Russian was to apply a translation method in training, in the retention tests, or in both training and the retention tests. This generalization held when the translation was oral or in writing.

The sixth finding showed that when the students attempted to learn both listening and speaking together the comprehension of Russian was significantly decreased. Our data suggest that the listening training should not include an attempt to speak the alien phonology. If a high level of listening fluency is achieved, there may be a "perceptual readiness" to begin making the foreign utterances. Future studies will be needed to show the amount of listening training which is necessary to produce a "perceptual readiness" for speaking. Still unsolved are these questions: Where in the listening training is the optimal point for making the transition from listening to speaking? Does that optimal transition point vary from student to student?

Finally, our data indicated that adults were far superior ($p < .0005$) to children in the second, fourth, and eighth grades in listening comprehension of Russian when all Ss learned with the Total Physical Response Method. This seems to contradict the common belief in the superiority of children for learning a foreign language. However, future studies may show that children have a pre-puberty biological proclivity which enables them to produce foreign utterances with fidelity.

Future implications

Certain developments in the miniaturization of electronic equipment can be applied to the problem of achieving listening fluency in a second language. We are now pre-testing a miniature wireless radio transmitter which permits the foreign language instructor to broadcast commands to his students who listen on a tiny FM radio receiver.

This means that the foreign language training is no longer confined to the classroom. The entire city can become the training environment. For example, the instructor can take a small group of students into a supermarket and apply the Total Physical Response Method by broadcasting commands in the foreign language such as the following:

"Rose, walk to the display of cereal!"

"Jim, walk to the canned peaches!"

"John, get a bag and fill it with potatoes."

"John, pick up a can of pickles and hand it to Rose."

There are no wires connecting the instructor's eight-ounce radio transmitter with the FM-receiver carried by each student. Since the student listens with an ear plug which is connected to his receiver, there is no disruption of the normal routine within the store since no one except the students can hear the instructor's voice.

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Footnotes

[1]Most of the studies reported in this article were supported by a research contract from the Personnel and Training Branch of the Office of Naval Research (NONR-4817(00), NR-154-257/12-8-64). Reproduction in whole or in part is permitted for any purpose of the United States Government.

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[2]For a detailed analysis of contemporary methods used to teach second languages, see Brown and Fiks (1967).

[3]In this study and all other studies reported in this paper, the *t* test was applied to each subtest in retention. We are aware that there is increased likelihood for significant *t*s to occur, as a function of randomness, when many *t* tests are run in a series. However, no alternate statistical test offered the clarity of the *t* test for our data. Further, in each series of thirty *t* tests, the number of significant *t*s was usually overwhelming, showing a consistent pattern before the null hypothesis was rejected.

[4]The hypothesis being tested was that perhaps a general reduction in muscular tension could explain the accelerated learning effect. Therefore, during retention tests, *S*s in Group 16 sat on an stationary exercise type bicycle, and had the option of pedling to reduce muscular tension.

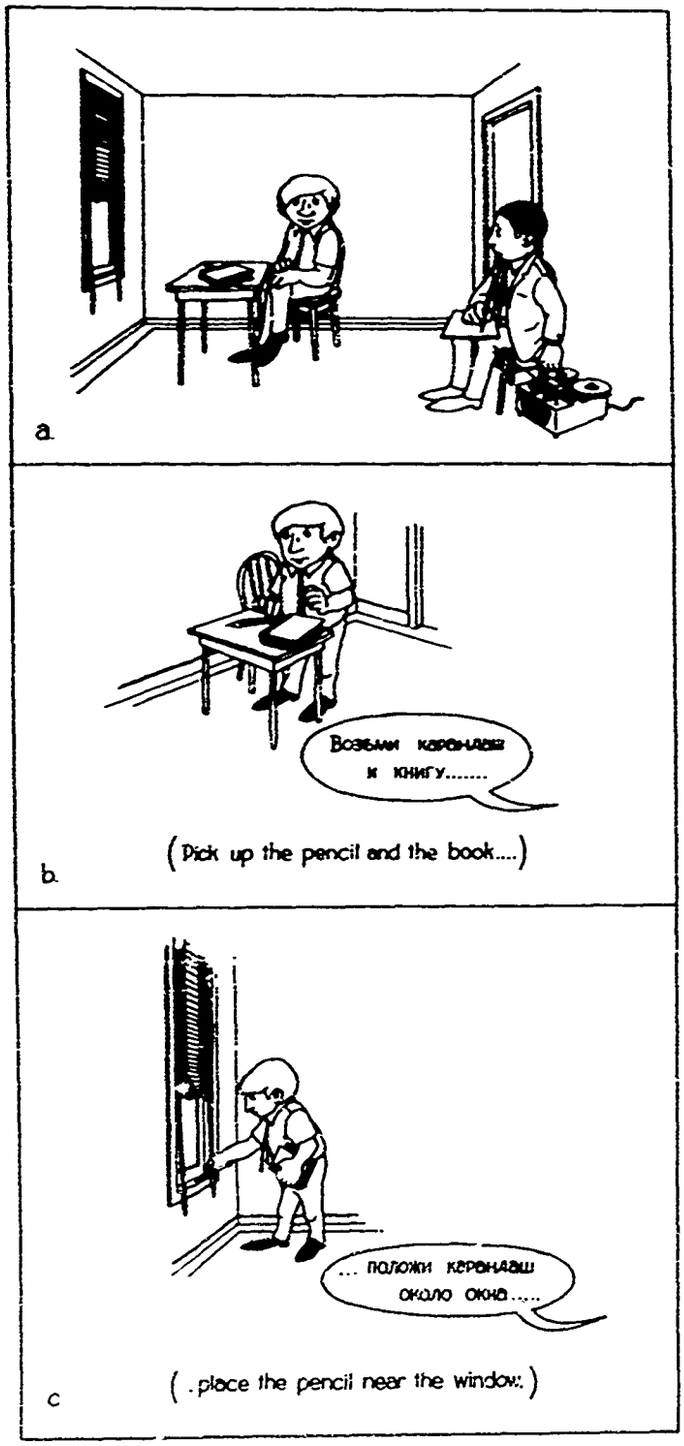

Figure 1 POSITION

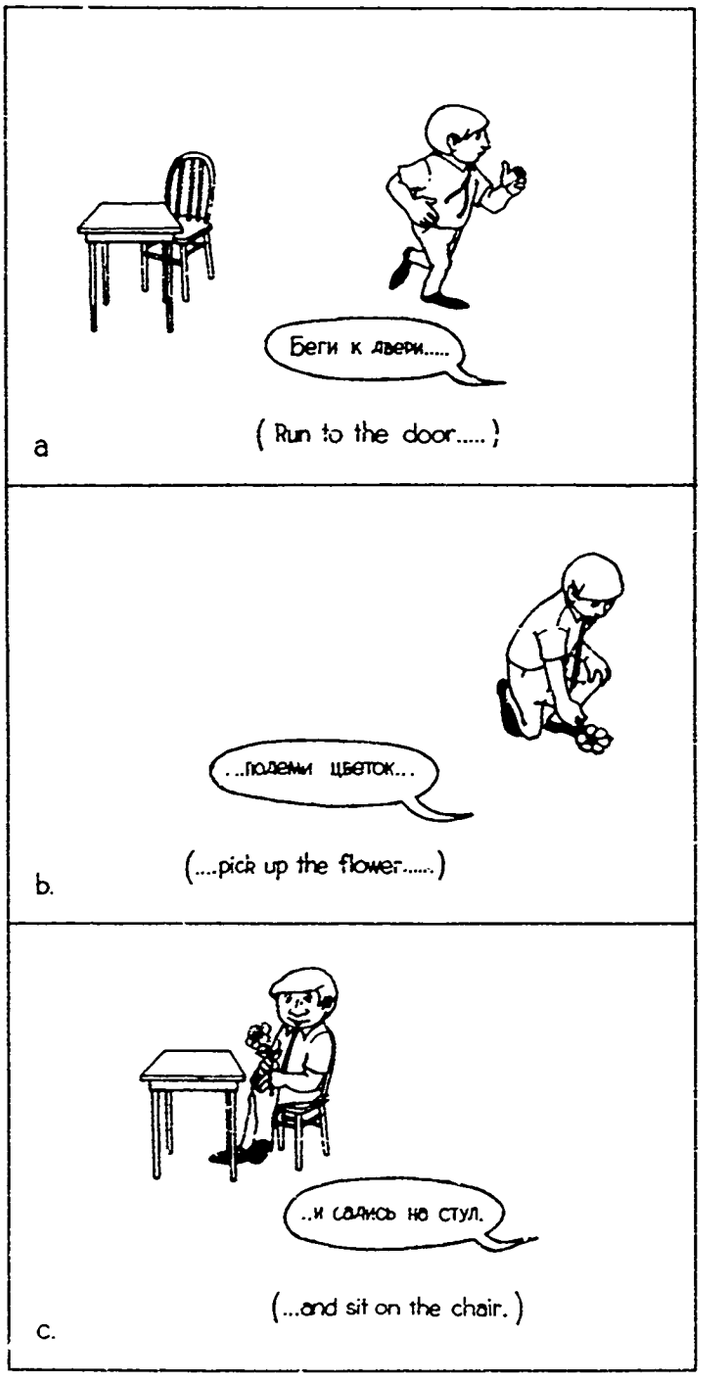

Figure 2. CONCURRENCY

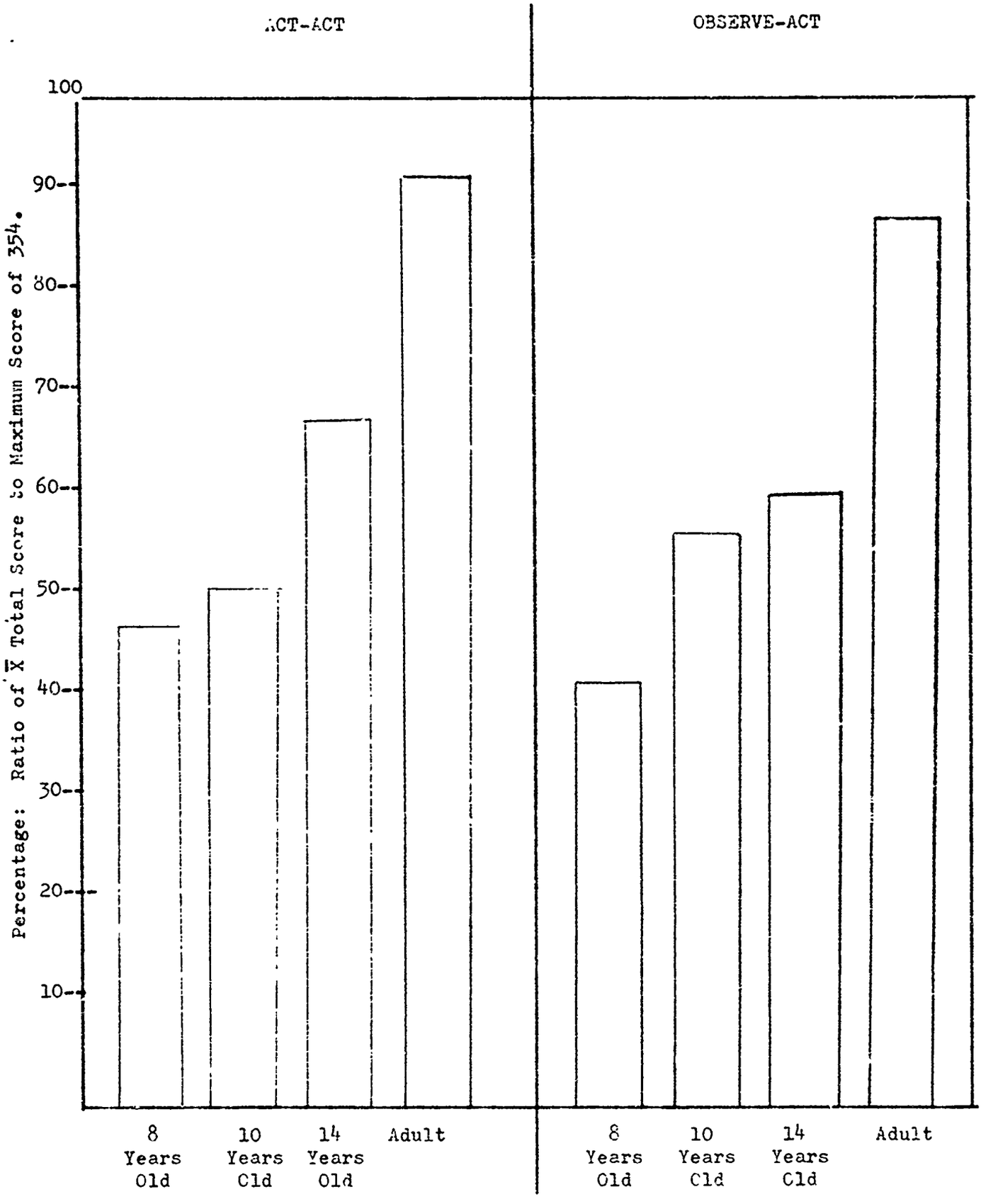

Fig. 3-Retention as measured by the total score from all retention tests.

Table I

Acting Versus Writing During Retention Tests

Retention Measures	Combined Groups 1 & 2 N=37 $\bar{X}$	s	Combined Groups 3 & 4 N=34 $\bar{X}$	s	t	Level of Significance (two-tailed test)
Unit I						
1. Total	17.02	3.11	15.47	2.62	2.25	.05
Unit II						
2. Total	19.33	2.40	18.91	3.67	.56	NS
3. Single	3.89	.32	3.85	.53	.40	NS
4. Short	15.43	2.41	15.06	3.63	.49	NS
Unit II (24 Hr)						
5. Total	30.06	3.33	28.74	5.27	1.23	NS
6. Single	16.62	1.97	16.12	2.59	.89	NS
7. Short	13.43	2.03	12.62	3.22	1.25	NS
Unit III						
8. Total	45.70	5.56	39.85	9.85	3.00	.01
9. Short	15.27	1.21	13.38	2.87	3.50	.001
10. Long	29.43	5.09	25.42	7.68	2.54	.02
11. Novel	17.54	4.78	14.58	6.45	2.14	.05
Unit III (48 Hr)						
12. Total	47.84	9.99	44.76	7.00	1.50	NS
13. Short	11.40	1.36	10.62	1.96	1.90	NS
14. Long	35.92	4.81	32.26	5.50	2.93	.01
15. Novel	22.25	4.40	18.64	5.50	2.98	.01
Unit IV						
16. Total	64.43	9.56	51.82	13.78	4.38	.001
17. Single	7.46	1.20	7.50	.94	.15	NS
18. Short	5.86	.55	5.58	.93	1.56	NS
19. Long	50.73	9.48	38.70	12.82	4.41	.001
20. Novel	34.54	5.41	25.88	8.63	4.95	.001
Two Week						
21. Total	95.05	6.46	78.97	14.74	5.78	.001
22. Single	12.94	.44	12.26	1.34	2.83	.01
23. Short	25.40	1.20	23.04	5.05	2.62	.02
24. Long	56.70	5.89	43.74	10.90	6.06	.001
25. Novel	27.78	4.44	19.18	7.14	5.93	.001
Combined						
26. Total	320.86	26.01	278.53	46.71	4.60	.001
27. Single	43.86	3.01	42.56	4.41	1.41	NS
28. Short	86.81	4.59	80.50	11.52	2.93	.01
29. Long	172.78	20.76	140.12	33.56	4.81	.001
30. Novel	102.38	15.60	78.29	25.04	5.07	.001

Table 2

Retention When Sequence, Position, and Cue were Absent

Retention Measures	Combined Groups 1 & 2 N=37		Combined Groups 8 & 9 N=36			Level of Significance (two-tailed test)
	$\bar{X}$	s	$\bar{X}$	s	t	
Unit I						
1. Total	17.02	3.11	15.56	3.76	1.78	NS
Unit II						
2. Total	19.33	2.40	18.58	3.55	1.04	NS
3. Single	3.89	.32	3.80	.68	.69	NS
4. Short	15.43	2.41	14.78	3.19	.97	NS
Unit II (24 Hr)						
5. Total	30.06	3.33	28.66	5.63	1.27	NS
6. Single	16.62	1.97	15.42	3.76	1.69	NS
7. Short	13.43	2.03	13.25	2.37	.35	NS
Unit III						
8. Total	45.70	5.56	38.97	8.61	3.89	.001
9. Short	15.27	1.21	12.28	3.39	4.90	.001
10. Long	29.43	5.09	25.70	6.13	2.78	.01
11. Novel	17.54	4.78	15.36	5.32	1.82	NS
Unit III (48 Hr)						
12. Total	47.84	9.99	41.30	9.95	2.76	.01
13. Short	11.40	1.36	9.48	3.16	3.31	.01
14. Long	35.92	4.81	30.00	7.20	4.05	.001
15. Novel	22.25	4.40	18.06	5.56	3.52	.001
Unit IV						
16. Total	64.43	9.56	53.19	16.34	3.52	.001
17. Single	7.46	1.20	7.22	1.50	.75	NS
18. Short	5.86	.55	4.62	1.38	4.96	.001
19. Long	50.73	9.48	41.52	14.78	3.11	.01
20. Novel	34.54	5.41	26.62	10.55	3.96	.001
Two Week						
21. Total	95.05	6.46	83.64	15.63	4.00	.001
22. Single	12.94	.44	11.89	1.79	3.39	.01
23. Short	25.40	1.20	22.16	4.52	4.10	.001
24. Long	56.70	5.89	49.14	11.43	3.48	.001
25. Novel	27.78	4.44	23.16	7.42	3.16	.01
Combined						
26. Total	320.86	26.01	279.25	54.13	4.11	.001
27. Single	43.86	3.01	40.89	6.75	2.40	.02
28. Short	86.81	4.59	76.62	13.68	4.18	.001
29. Long	172.78	20.76	146.36	35.38	3.82	.001
30. Novel	102.38	15.60	84.00	25.43	3.64	.001

Table 3

Retention When Position and Cue were Absent

Retention Measures	Combined Groups 1 & 2 N=37		Group 10 N=12			Level of Significance (two-tailed test)
	$\bar{X}$	s	$\bar{X}$	s	t	
Unit I						
1. Total	17.02	3.11	15.33	3.16	1.62	NS
Unit II						
2. Total	19.33	2.40	18.50	3.13	.84	NS
3. Single	3.89	.32	3.83	.41	.46	NS
4. Short	15.43	2.41	14.67	3.03	.79	NS
Unit II (24 Hr)						
5. Total	30.06	3.33	28.42	2.01	2.06	.05
6. Single	16.62	1.97	16.92	1.44	.57	NS
7. Short	13.43	2.03	12.00	1.41	2.72	.01
Unit III						
8. Total	45.70	5.56	39.25	6.09	3.26	.01
9. Short	15.27	1.21	12.08	2.76	3.88	.001
10. Long	29.43	5.09	26.17	4.27	2.19	.05
11. Novel	17.54	4.78	15.03	3.35	1.97	NS
Unit III (48 Hr)						
12. Total	47.84	9.99	44.75	6.56	1.23	NS
13. Short	11.40	1.36	10.55	1.63	1.57	NS
14. Long	35.92	4.81	32.33	5.14	2.14	.05
15. Novel	22.25	4.40	18.83	4.43	2.33	.05
Unit IV						
16. Total	64.43	9.56	52.17	10.34	3.63	.001
17. Single	7.46	1.20	7.33	1.21	.32	NS
18. Short	5.86	.55	5.50	.83	1.40	NS
19. Long	50.73	9.48	38.50	9.12	4.00	.001
20. Novel	34.54	5.41	27.17	7.15	3.28	.01
Two Week						
21. Total	95.05	6.46	84.25	15.23	2.39	.05
22. Single	12.94	.44	12.08	1.30	2.25	.05
23. Short	25.40	1.20	22.08	5.09	2.24	.05
24. Long	56.70	5.89	49.92	10.71	2.09	.05
25. Novel	27.78	4.44	23.75	7.49	1.76	NS
Combined						
26. Total	320.86	26.01	283.42	34.38	3.46	.01
27. Single	43.86	3.01	41.92	6.75	.96	NS
28. Short	86.81	4.59	76.92	9.64	3.43	.01
29. Long	172.78	20.76	148.00	23.57	3.26	.01
30. Novel	102.38	15.60	84.83	18.61	2.95	.01

Table 4

Retention When Training Trials were Reduced

Retention Measures	Group 14 N=13 $\bar{X}$	s	Group 18 N=18 $\bar{X}$	s	t	Level of Significance (one-tailed test)
Unit I						
1. Total	17.08	3.33	16.16	3.07	.76	NS
Unit II						
2. Total	18.92	2.29	16.50	3.17	2.40	.025
3. Single	3.46	.78	3.56	.85	.33	NS
4. Short	15.46	1.85	12.94	2.82	2.90	.005
Unit II (24 Hr)						
5. Total	31.31	2.66	25.67	4.88	4.00	.0005
6. Single	17.00	1.00	15.94	2.50	1.58	NS
7. Short	14.31	2.25	9.72	3.68	4.17	.0005
Unit III						
8. Total	35.23	11.35	27.94	7.87	1.92	.05
9. Short	13.77	6.12	10.50	3.76	1.64	NS
10. Long	20.46	8.30	16.44	5.22	1.48	NS
11. Novel	11.00	5.68	7.33	2.79	2.07	.025
Unit III (48 Hr)						
12. Total	46.00	6.38	33.72	11.29	3.72	.0005
13. Short	11.31	1.38	8.22	2.92	3.81	.0005
14. Long	32.85	5.35	23.77	8.01	3.66	.0005
15. Novel	18.54	5.65	12.61	6.23	2.67	.01
Unit IV						
16. Total	52.23	11.08	42.72	10.13	2.36	.025
17. Single	7.77	.54	7.06	1.05	2.54	.01
18. Short	6.00	.00	5.61	.85	1.95	.05
19. Long	38.46	11.06	30.05	9.53	2.13	.025
20. Novel	26.69	11.04	21.05	5.95	1.61	NS
Two Week						
21. Total	82.18	16.17	68.28	18.09	2.06	.025
22. Single	12.09	2.02	12.00	1.37	.12	NS
23. Short	22.91	6.09	19.11	5.67	1.60	NS
24. Long	47.18	11.06	37.05	12.63	2.18	.025
25. Novel	22.27	6.56	16.50	6.76	2.18	.025
Combined						
26. Total	284.45	38.18	231.00	48.55	3.17	.005
27. Single	40.54	2.16	38.56	3.79	1.72	.05
28. Short	84.27	8.87	66.11	16.12	3.78	.0005
29. Long	139.64	31.51	107.00	29.89	2.65	.01
30. Novel	79.45	21.41	57.20	17.97	2.76	.005

Table 5

Retention When Training Trials were Reduced

Retention Measures	Group 15 N=8		Group 19 N=11			Level of Significance (one-tailed test)
	$\bar{X}$	s	$\bar{X}$	s	t	
Unit I						
1. Total	16.00	2.67	13.73	2.72	1.71	NS
Unit II						
2. Total	19.25	2.19	15.00	3.19	3.27	.005
3. Single	3.50	.76	3.09	1.22	.85	NS
4. Short	15.75	1.75	11.91	2.50	3.73	.005
Unit II (24 Hr)						
5. Total	28.86	6.06	21.64	7.76	2.15	.025
6. Single	15.50	3.47	11.82	4.49	1.91	.05
7. Short	13.38	2.72	9.82	4.04	2.17	.025
Unit III						
8. Total	30.88	8.13	25.73	8.93	1.24	NS
9. Short	11.25	4.47	8.36	3.90	1.38	NS
10. Long	18.63	5.29	16.45	6.31	.77	NS
11. Novel	10.00	4.21	7.18	3.60	1.44	NS
Unit III (48 Hr)						
12. Total	34.38	12.22	28.45	11.74	1.00	NS
13. Short	8.86	2.85	6.00	4.00	1.72	NS
14. Long	23.75	9.78	21.09	8.09	.59	NS
15. Novel	14.75	5.70	11.66	5.33	1.13	NS
Unit IV						
16. Total	47.88	13.28	38.27	8.49	1.69	NS
17. Single	7.50	.76	6.45	1.57	1.84	.05
18. Short	5.63	.74	5.00	1.42	1.19	NS
19. Long	34.75	12.26	26.82	6.67	1.56	NS
20. Novel	25.75	7.63	20.18	5.15	1.68	NS
Two Week						
21. Total	81.14	15.65	61.27	19.08	2.26	.025
22. Single	12.00	1.53	11.00	2.00	1.12	NS
23. Short	22.28	5.68	18.00	6.96	1.34	NS
24. Long	46.86	10.48	32.27	11.21	2.62	.01
25 Novel	22.28	5.91	14.36	6.25	2.54	.025
Combined						
26. Total	266.28	51.12	202.45	52.05	2.40	.025
27. Single	39.43	5.26	32.36	8.34	2.08	.05
28. Short	79.86	13.23	57.09	17.83	2.92	.005
29. Long	128.14	33.44	96.64	28.66	1.92	.05
30. Novel	76.14	19.38	53.36	17.33	2.37	.025

Table 6

Retention When Ss Learn Listening and Speaking Together

Retention Measures	Combined Groups 1 & 2 N=37		Combined Groups 20&21 N=24			Level of Significance (one-tailed test)
	$\bar{X}$	s	$\bar{X}$	s	t	
Unit I						
1. Total	17.02	3.11	15.37	4.32	1.59	NS
Unit II						
2. Total	19.33	2.40	17.92	3.57	1.68	.05
3. Single	3.89	.32	3.50	.72	2.44	.01
4. Short	15.43	2.41	14.42	3.31	1.26	NS
Unit II (24 Hr)						
5. Total	30.06	3.33	30.50	2.92	.54	NS
6. Single	16.62	1.97	16.33	3.55	.36	NS
7. Short	13.43	2.03	13.50	2.24	.12	NS
Unit III						
8. Total	45.70	5.56	34.00	9.65	5.27	.0005
9. Short	15.27	1.21	12.58	3.99	3.13	.005
10. Long	29.43	5.09	20.33	6.92	5.45	.0005
11. Novel	17.54	4.78	9.84	4.76	6.06	.0005
Unit III (48 Hr)						
12. Total	47.84	9.99	43.62	8.68	1.72	.05
13. Short	11.40	1.36	10.42	2.08	2.00	.025
14. Long	35.92	4.81	31.29	7.32	2.69	.005
15. Novel	22.25	4.40	17.92	5.86	3.05	.005
Unit IV						
16. Total	64.43	9.56	56.71	12.88	2.47	.01
17. Single	7.46	1.20	6.80	.98	2.28	.025
18. Short	5.86	.55	5.83	.68	.18	NS
19. Long	50.73	9.48	43.34	2.38	.025	
20. Novel	34.54	5.41	30.21	7.32	2.45	.01
Two Week						
21. Total	95.05	6.46	91.16	11.09	1.52	.10
22. Single	12.94	.44	12.79	.67	.94	NS
23. Short	25.40	1.20	25.04	2.56	.63	NS
24. Long	56.70	5.89	53.33	8.87	1.61	.10
25. Novel	27.73	4.44	25.67	6.11	1.44	.10
Combined						
26. Total	320.86	26.01	289.30	35.97	3.64	.0005
27. Single	43.86	3.01	40.29	3.95	3.72	.0005
28. Short	86.81	4.59	81.79	9.16	2.44	.01
29. Long	172.78	20.76	148.29	26.95	3.71	.0005
30. Novel	102.38	15.60	83.62	17.78	4.14	.0005

Table 7

Means and Standard Deviations for the Modern Language Aptitude Test (Total Score)

Group	N	$\bar{X}$	s
5	13	112.69	30.34
7	8	124.62	23.11
10	8	103.62	28.02
11	10	119.30	29.87
13	8	98.38	28.29
14	10	131.10	16.91
15	6	124.67	25.53
16	7	134.14	19.33
18	15	123.60	30.00
19	11	101.82	20.91
20	15	115.67	22.99
21	9	109.33	22.69

Appendix A

Means and Standard Deviations of Retention Scores

Retention Measures	Group 1 Act-Act N=18		Group 2 Observe-Act N=19		Combined Groups 1 & 2 N=37		Group 3 Observe-Write N=17	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
Unit I								
1. Total	17.61	2.76	16.47	3.27	17.02	3.11	15.53	3.20
Unit II								
2. Total	18.67	2.93	19.95	1.59	19.33	2.40	19.35	2.75
3. Single	3.89	.33	3.89	.32	3.89	.32	3.82	.54
4. Short	14.78	2.86	16.05	1.62	15.43	2.41	15.53	2.66
Unit II (24 Hr)								
5. Total	30.56	3.90	29.58	2.66	30.06	3.33	29.06	4.87
6. Single	17.17	1.51	16.10	2.19	16.62	1.97	16.18	2.13
7. Short	13.39	2.55	13.47	1.54	13.43	2.03	12.88	3.36
Unit III								
8. Total	47.44	5.12	44.05	5.48	45.70	5.56	42.29	9.88
9. Short	15.72	.59	14.84	1.50	15.27	1.21	14.06	2.61
10. Long	30.72	4.74	28.21	5.09	29.43	5.09	27.18	7.87
11. Novel	18.56	4.89	16.58	4.44	17.54	4.78	16.76	5.64
Unit III (48 Hr)								
12. Total	49.61	6.05	46.16	12.42	47.84	9.99	46.00	6.94
13. Short	11.72	.69	11.10	1.71	11.40	1.36	11.06	1.65
14. Long	35.89	5.80	35.95	3.60	35.92	4.81	33.12	5.55
15. Novel	22.56	5.15	21.95	3.57	22.25	4.40	19.53	5.24
Unit IV								
16. Total	64.83	8.90	64.05	10.13	64.43	9.56	56.53	12.01
17. Single	7.72	.77	7.21	1.48	7.46	1.20	7.65	.63
18. Short	5.89	.48	5.84	.52	5.86	.55	5.76	.45
19. Long	50.50	9.50	50.95	9.44	50.73	9.48	43.06	11.56
20. Novel	35.00	4.68	34.10	5.85	34.54	5.41	28.59	8.20
Two Week								
21. Total	94.89	5.89	95.21	6.84	95.05	6.46	81.47	15.85
22. Single	12.94	.24	12.95	.24	12.94	.44	12.35	1.15
23. Short	25.72	.59	25.10	1.45	25.40	1.20	23.47	5.04
24. Long	56.22	5.39	57.16	6.25	56.70	5.89	45.65	11.18
25. Novel	27.00	4.22	28.53	4.44	27.78	4.44	21.00	7.37
Combined								
26. Total	323.61	27.85	318.26	23.77	320.86	26.01	290.24	46.95
27. Single	44.72	2.17	43.05	3.38	43.86	3.01	42.76	3.52
28. Short	87.22	5.63	86.42	3.32	86.81	4.59	82.76	11.22
29. Long	173.33	21.61	172.26	19.89	172.78	20.76	149.00	33.74
30. Novel	103.11	16.27	101.68	14.96	102.38	15.60	85.88	24.75

Appendix A (Continued)

Means and Standard Deviations of Retention Scores

Retention Measures	Group 4 Act-Write N=17		Combined Groups 3&4 N=34		Group 5 Act-Act with Position Absent N=15		Group 6 Act-Act with Concurrency Absent N=21	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
Unit I								
1. Total	15.41	1.86	15.47	2.62	16.07	4.07	15.81	3.51
Unit II								
2. Total	18.47	4.36	18.91	3.67	18.13	3.75	18.62	2.66
3. Single	3.88	.50	3.85	.53	3.87	.53	3.62	.68
4. Short	14.59	4.34	15.06	3.63	14.27	3.40	15.00	2.49
Unit II (24 Hr)								
5. Total	28.41	5.68	28.74	5.27	27.60	5.42	28.52	4.11
6. Single	16.06	2.97	16.12	2.59	15.60	2.79	16.19	2.35
7. Short	12.35	3.09	12.62	3.22	12.00	3.39	12.33	2.32
Unit III								
8. Total	37.41	9.19	39.85	9.85	40.47	9.07	40.71	8.93
9. Short	12.70	2.96	13.38	2.87	12.93	4.35	13.81	3.25
10. Long	23.65	7.09	25.42	7.68	26.67	5.76	25.90	6.76
11. Novel	12.41	6.46	14.58	6.45	15.07	5.38	15.14	5.39
Unit III (48 Hr)								
12. Total	43.53	6.78	44.76	7.00	45.80	7.40	47.90	6.29
13. Short	10.18	2.13	10.62	1.96	11.00	1.75	11.33	1.50
14. Long	31.41	5.26	32.26	5.50	33.00	6.04	34.62	5.41
15. Novel	17.76	5.59	18.64	5.50	19.73	5.03	21.28	4.43
Unit IV								
16. Total	47.12	13.79	51.82	13.78	58.67	12.52	60.00	11.87
17. Single	7.35	1.15	7.50	.94	7.27	.99	7.38	.94
18. Short	5.41	1.16	5.58	.93	5.67	.64	5.76	.55
19. Long	34.35	12.50	38.70	12.82	45.37	12.02	46.86	11.47
20. Novel	23.18	8.16	25.88	8.63	32.00	6.93	31.81	7.67
Two Week								
21. Total	76.47	13.06	78.97	14.74	89.53	13.53	93.43	9.64
22. Single	12.18	1.42	12.26	1.34	12.13	1.40	12.62	.76
23. Short	23.00	2.73	23.04	5.05	22.80	4.83	24.86	2.39
24. Long	41.82	10.30	43.74	10.90	54.47	9.36	56.05	7.37
25. Novel	17.35	6.45	19.18	7.14	27.33	4.80	28.24	3.94
Combined								
26. Total	266.82	43.41	278.53	46.71	296.27	45.40	305.19	38.08
27. Single	42.35	5.22	42.56	4.41	41.67	4.70	42.76	3.87
28. Short	78.24	11.37	80.50	11.52	78.67	14.63	81.86	10.72
29. Long	131.24	30.92	140.12	33.56	159.87	28.35	163.67	26.67
30. Novel	70.70	22.93	78.29	25.04	94.13	18.65	92.57	21.63

Appendix A (Continued)

Means and Standard Deviations of Retention Scores

Retention Measures	Group 7 Act-Act with Cue Absent N=10		Group 8 Act-Act with Sequence Position and Cue Absent N=18		Group 9 Act-Write with Sequence Position and Cue Absent N=12		Combined Groups 8 &9 N=36	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
Unit I								
1. Total	15.40	4.48	15.89	3.65	15.22	3.8[illegible]	15.56	3.76
Unit II								
2. Total	18.00	4.55	18.61	4.10	18.56	2.83	18.58	3.55
3. Single	3.90	.33	3.78	.75	3.83	.53	3.80	.68
4. Short	14.10	4.26	14.83	3.53	14.72	2.86	14.78	3.19
Unit II (24 Hr)								
5. Total	29.80	5.90	28.39	5.65	28.94	5.55	28.66	5.63
6. Single	16.00	3.22	14.89	4.01	15.94	3.45	15.42	3.76
7. Short	13.80	2.93	13.50	2.21	13.00	2.50	13.25	2.37
Unit III								
8. Total	37.10	5.32	38.50	7.17	39.44	9.82	38.97	8.61
9. Short	10.90	2.41	12.33	3.23	12.22	3.57	12.28	3.39
10. Long	25.30	3.98	25.17	4.88	26.22	7.16	25.70	6.13
11. Novel	14.60	3.72	14.94	4.29	15.77	6.17	15.36	5.32
Unit III (48 Hr)								
12. Total	47.60	6.17	40.44	9.70	42.17	10.07	41.30	9.95
13. Short	10.70	2.22	8.56	3.35	10.39	2.69	9.48	3.16
14. Long	35.00	4.61	30.06	6.81	29.94	7.58	30.00	7.20
15. Novel	21.10	4.78	18.00	4.45	18.11	6.51	18.06	5.56
Unit IV								
16. Total	58.20	12.83	51.44	16.68	54.94	15.81	53.19	16.34
17. Single	7.50	.74	6.89	1.90	7.56	.72	7.22	1.50
18. Short	5.40	1.13	4.56	1.28	4.67	1.50	4.62	1.38
19. Long	45.30	12.15	40.33	14.94	42.72	14.50	41.52	14.78
20. Novel	30.70	8.89	25.67	10.00	27.65	11.02	26.62	10.55
Two Week								
21. Total	86.80	13.14	80.89	15.34	86.39	15.44	83.64	15.63
22. Single	12.90	.33	11.72	1.83	12.06	1.74	11.89	1.79
23. Short	22.70	4.36	21.39	4.72	22.94	4.12	22.16	4.52
24. Long	51.20	9.23	47.78	10.28	50.50	12.32	49.14	11.43
25. Novel	25.70	4.77	23.00	6.58	23.33	8.15	23.16	7.42
Combined								
26. Total	293.00	40.04	272.94	48.96	285.56	58.16	279.25	54.13
27. Single	43.30	4.13	40.11	7.51	41.67	5.78	40.89	6.75
28. Short	77.70	12.13	75.17	13.69	78.06	13.58	76.62	13.68
29. Long	156.60	26.81	143.11	31.02	149.61	38.99	146.36	35.38
30. Novel	92.30	20.26	81.89	21.34	86.28	28.76	84.08	25.43

Appendix A (Continued)

Means and Standard Deviations of Retention Scores

Retention Measures	Group 10 Act-Act with Position and Cue Absent N=12		Group 11 Oral Translation-Act N=11		Group 12 Observe-Oral Translation N=17		Group 13 Oral Translation-Write N=11	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
Unit I								
1. Total	15.33	3.16	14.82	3.34	15.35	3.34	10.18	4.05
Unit II								
2. Total	18.50	3.13	17.09	3.48	18.47	3.40	15.91	5.65
3. Single	3.83	.41	3.09	1.14	3.82	.40	2.91	1.30
4. Short	14.67	3.03	14.00	2.79	14.65	3.20	13.00	4.73
Unit II (24 Hr)								
5. Total	28.42	2.01	26.09	2.16	28.70	4.52	23.73	8.53
6. Single	16.92	1.44	14.91	3.53	16.65	1.74	13.27	5.02
7. Short	12.00	1.41	11.18	4.29	12.00	3.32	10.45	4.41
Unit III								
8. Total	39.25	6.09	32.45	13.20	39.47	7.71	27.82	11.44
9. Short	12.08	2.76	9.64	5.14	13.29	2.89	8.27	4.61
10. Long	26.17	4.27	21.82	8.78	25.06	5.50	18.54	7.39
11. Novel	15.08	3.35	11.09	7.36	14.12	4.59	10.00	5.04
Unit III (48 Hr)								
12. Total	44.75	6.56	40.36	11.37	42.29	6.53	33.18	10.86
13. Short	10.55	1.63	9.82	2.60	10.18	2.00	7.45	2.66
14. Long	32.33	5.14	28.82	8.85	30.18	4.85	24.27	8.64
15. Novel	18.83	4.43	15.00	8.67	16.76	4.81	12.54	5.72
Unit IV								
16. Total	52.17	10.34	44.82	17.77	50.94	11.27	45.91	11.54
17. Single	7.33	1.21	7.09	1.37	7.47	.74	6.82	1.25
18. Short	5.50	.83	5.54	.69	5.82	.54	5.45	1.04
19. Long	38.50	9.12	32.18	16.45	37.59	10.77	33.64	10.89
20. Novel	27.17	7.15	22.54	10.56	25.18	6.84	22.91	7.29
Two Week								
21. Total	84.25	15.23	71.54	26.52	83.76	10.96	54.67	20.31
22. Single	12.08	1.30	11.64	2.69	12.59	.64	10.00	3.16
23. Short	22.08	5.09	21.45	7.19	24.29	2.41	14.33	6.96
24. Long	49.92	10.71	38.45	1858	46.88	8.78	30.33	17.34
25. Novel	23.75	7.49	18.45	10.14	22.00	5.56	15.00	5.59
Combined								
26. Total	283.42	34.48	247.27	75.77	264.06	70.75	207.44	57.75
27. Single	41.92	6.75	36.72	6.96	46.00	11.54	32.44	7.80
28. Short	76.92	9.64	71.64	14.04	83.88	20.84	54.44	18.56
29. Long	148.00	23.57	121.27	50.41	136.06	29.19	101.11	33.54
30. Novel	84.83	18.61	67.09	35.53	72.88	26.66	56.56	20.40

Appendix A (Continued)

Means and Standard Deviations of Retention Scores

Retention Measures	Group 14 Observe-Oral Translation with a Model in Action N=13		Group 15 Oral Translation-Translation Oral N=8		Group 16 Act-Oral Translation while S Peddled an Exercise Bicycle N=11	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
Unit I						
1. Total	17.08	3.33	16.00	2.67	16.36	3.47
Unit II						
2. Total	18.92	2.29	19.25	2.19	19.64	2.80
3. Single	3.46	.78	3.50	.76	3.91	.30
4. Short	15.46	1.85	15.75	1.75	15.73	2.76
Unit II (24 Hr)						
5. Total	31.31	2.66	28.86	6.06	30.09	4.46
6. Single	17.00	1.00	15.50	3.47	16.45	1.86
7. Short	14.31	2.25	13.38	2.72	13.64	3.07
Unit III						
8. Total	35.23	11.35	30.88	8.13	32.82	6.09
9. Short	13.77	6.12	11.25	4.47	11.64	3.17
10. Long	20.46	8.30	18.63	5.29	20.13	3.80
11. Novel	11.00	5.68	10.00	4.21	9.64	3.47
Unit III (48 Hr)						
12. Total	46.00	6.38	34.38	12.22	39.36	9.33
13. Short	11.31	1.38	8.86	2.85	9.73	3.13
14. Long	32.85	5.35	23.75	9.78	28.18	6.39
15. Novel	18.54	5.65	14.75	5.70	15.73	3.85
Unit IV						
16. Total	52.23	11.08	47.88	13.28	46.82	6.72
17. Single	7.77	.54	7.50	.76	7.18	.98
18. Short	6.00	.00	5.63	.74	5.91	.30
19. Long	38.46	11.06	34.75	12.26	33.73	6.54
20, Novel	26.69	11.04	25.75	7.63	24.09	6.01
Two Week						
21. Total	82.18	16.17	81.14	15.65	79.89	13.23
22. Single	12.09	2.02	12.00	1.53	12.00	1.58
23. Short	22.91	6.09	22.28	5.68	22.78	3.63
24. Long	47.18	11.06	46.86	10.48	45.11	10.76
25. Novel	22.27	6.56	22.28	5.91	25.33	12.20
Combined						
26. Total	284.45	38.18	266.28	51.12	269.88	29.69
27. Single	40.54	2.16	39.43	5.26	39.89	3.52
28. Short	84.27	8.87	79.86	13.23	80.44	9.34
29. Long	139.64	31.51	128.14	33.44	129.78	19.25
30. Novel	79.45	21.41	76.14	19.38	76.89	19.67

Appendix A (Continued)

Means and Standard Deviations of Retention Scores

Retention Measures	Group 17 Observe-Oral Translation N=17		Group 18 Observe-Oral Translation with a Model in Action (see Study II) N=18		Group 19 Oral Translation-Oral Translation (see Study II) N=11	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
Unit I						
1. Total	.00	.00	16.16	3.07	13.73	2.72
Unit II						
2. Total	.00	.00	16.50	3.17	15.00	3.19
3. Single	.00	.00	3.56	.85	3.09	1.22
4. Short	.00	.00	12.94	2.82	11.91	2.50
Unit II (24 Hr)						
5. Total	29.25	3.72	25.67	4.88	21.64	7.76
6. Single	16.75	1.69	15.94	2.50	11.82	4.49
7. Short	12.50	2.29	9.72	3.68	9.82	4.04
Unit III						
8. Total	43.45	6.43	27.94	7.87	25.73	8.93
9. Short	13.65	2.24	10.50	3.76	8.36	3.90
10. Long	28.75	4.56	16.44	5.22	16.45	6.31
11. Novel	16.05	5.24	7.33	2.79	7.18	3.60
Unit III (48 Hr)						
12. Total	50.45	3.90	33.72	11.29	28.45	11.74
13. Short	11.45	1.51	8.22	2.92	6.00	4.00
14. Long	37.00	2.88	23.77	8.01	21.09	8.09
15. Novel	23.25	2.68	12.61	6.23	11.66	5.33
Unit IV						
16. Total	61.70	10.82	42.72	10.13	38.27	8.49
17. Single	7.45	.91	7.06	1.05	6.45	1.57
18. Short	5.70	.59	5.61	.85	5.00	1.42
19. Long	48.55	10.04	30.05	9.53	26.82	6.67
20. Novel	31.85	6.76	21.05	5.95	20.18	5.15
Two Week						
21. Total	91.25	14.32	68.28	18.09	61.27	19.08
22. Single	11.75	2.64	12.00	1.37	11.00	2.00
23. Short	23.85	3.86	19.11	5.67	18.00	6.96
24. Long	55.70	9.95	37.05	12.63	32.27	11.21
25. Novel	27.65	5.90	16.50	6.76	14.36	6.25
Combined						
26. Total	.00	.00	231.00	48.55	202.45	52.05
27. Single	.00	.00	38.56	3.79	32.36	8.34
28. Short	.00	.00	66.11	16.12	57.09	17.83
29. Long	.00	.00	107.00	29.89	96.64	28.66
30. Novel	.00	.00	57.20	17.97	53.36	17.33

Appendix A (Continued)

Means and Standard Deviations of Retention Scores

Retention Measures	Group 20 Act-Act, but Ss Speak Russian in Training N=15		Group 21 Observe-Act but Ss Speak Russian in Training N=9		Combined Groups 20 & 21 N=24	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
Unit I						
1. Total	14.20	4.76	17.33	2.35	17.02	3.11
Unit II						
2. Total	17.27	3.82	19.00	2.83	19.33	2.40
3. Single	3.60	.26	3.33	1.12	3.89	.32
4. Short	13.67	3.50	15.67	2.50	15.43	2.41
Unit II (24 Hr)						
5. Total	29.67	2.82	31.89	2.47	30.06	3.33
6. Single	16.60	1.84	15.89	5.23	16.62	1.97
7. Short	13.07	2.22	14.22	2.05	13.43	2.03
Unit III						
8. Total	31.60	9.28	38.00	8.89	45.70	5.56
9. Short	12.27	3.94	13.11	3.98	15.27	1.21
10. Long	18.20	6.70	23.89	5.69	29.43	5.09
11. Novel	8.47	3.91	12.11	5.19	17.54	4.78
Unit III (48 Hr)						
12. Total	43.20	8.66	44.33	8.61	47.84	9.99
13. Short	10.13	1.92	10.89	2.32	11.40	1.36
14. Long	31.20	7.65	31.44	6.73	35.92	4.81
15. Novel	17.80	6.07	18.11	5.53	22.25	4.40
Unit IV						
16. Total	54.60	12.18	60.22	13.27	64.43	9.56
17. Single	6.22	.63	7.78	.44	7.46	1.20
18. Short	5.93	.26	5.67	1.00	5.86	.55
19. Long	41.27	12.27	46.78	12.88	50.73	9.48
20. Novel	29.47	6.24	31.44	8.71	35.54	5.41
Two Week						
21. Total	88.93	13.10	94.89	4.19	95.05	6.46
22. Single	12.67	.72	13.00	.00	12.94	.44
23. Short	24.80	3.05	25.44	1.33	25.40	1.20
24. Long	51.47	10.39	56.44	3.65	56.70	5.89
25. Novel	24.67	7.12	27.33	3.32	27.78	4.44
Combined						
26. Total	279.47	36.13	305.67	29.20	320.86	26.01
27. Single	40.47	2.59	40.00	5.43	43.86	3.01
28. Short	79.87	9.30	85.00	7.84	86.81	4.59
29. Long	142.13	26.77	158.56	23.94	172.78	20.76
30. Novel	80.40	16.30	89.00	18.47	102.38	15.60

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13. ABSTRACT

The purpose of this report was to evaluate the Total Physical Response Method for learning to understand spoken Russian. Ss listened to commands in Russian, then along with a model, obeyed with a physical action. Early in training the commands in Russian were one-word utterances as "Stand!", "Sit!", "Run!", "Stop!", "Turn!", and "Squat!" Later, the commands were expanded in complexity as for example, "Walk to the table, pick up the book, and put it down near the door."

The primary results showed that Ss who learned with the total physical response technique retained significantly more Russian ($p<.001$ using two-tailed t tests) than control Ss who translated into English. The second finding was that the facilitating effect occurred during the performance task - the retention tests, rather than in training. The third finding was that a training procedure in which an attempt was made to acquire together, both listening and speaking of Russian significantly decreased the understanding of Russian in comparison with Ss receiving listening training only. The fourth result was that when the action technique was applied to both adults and children, the adults vastly outperformed the children in listening comprehension of Russian.

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